Combustion Controls Solutions & Environmental Services, Inc.

3132 Wilford Drive
Toledo, OH 43617

CCS&ES, INC. INSPECTION REPORT
OXIDIZER ELECTRICAL AUDIT

PLANT: _____   LINE # : _____   DATE: _____

OXIDIZER TYPE: RTO _____ RECOUP _____ CATALYTIC _____

MACHINE CONDITION / OPERATION:
A - GOOD   C - NEEDS ADJUSTMENT   E – NEEDS REPLACEMENT IMMEDIATELY
B - FAIR   D - NEEDS REPLACEMENT

ITEM	CONDITION	COMMENTS
ELECTRICAL		
1. Control Panels / Junction Boxes		
A. Conduits and conduit penetrations		
B. Door seals		
C. Ventilation fans / filters		
D. Panel heaters / coolers		
2. Main Control Cabinet		
A. Cooling System		
Filters Clean		
Functioning (Providing cold air if AC system)		
Condensate Drain Clear (If Applicable)		
B. Main Feeder		
FLA (Full Load Amps)		
Voltage (at FLA)		
Main Disconnect Switch/Breaker		
Terminals Checked & Tightened		
Contacts Cleaned		
Conductor Tags Legible		
Disconnect Switch Cycled		
C. Variable Frequency Drive		
FLA (Full Load Running Amps)		
Voltage (at FLA)		
Drive Disconnect Switch/Breaker		
Terminals Checked & Tightened		
Contacts Cleaned		
Conductor Tags Legible		
Disconnect Switch Cycled		
D. Drive Line Reactors		
Terminals Checked & Tightened		
Contacts Cleaned		
Conductor Tags Legible		
Disconnect Switch Cycled		
3. Thermocouples		
A. Thermocouple label:_____		
1. Location		
2. Wire Numbers and Destination		
3. Independent verification performed	Yes / No	
System reading C/F _____		
Instrument reading C/F _____		

ITEM	CONDITION	COMMENTS
B. Thermocouple label:_____		
1. Location		
2. Wire Numbers and Destination		
3. Independent verification performed	Yes / No	
System reading C/F _____		
Instrument reading C/F _____		
C. Thermocouple label:_____		
1. Location		
2. Wire Numbers and Destination		
3. Independent verification performed	Yes / No	
System reading C/F _____		
Instrument reading C/F _____		
D. Thermocouple label:_____		
1. Location		
2. Wire Numbers and Destination		
3. Independent verification performed	Yes / No	
System reading C/F _____		
Instrument reading C/F _____		
E. Thermocouple label:_____		
1. Location		
2. Wire Numbers and Destination		
3. Independent verification performed	Yes / No	
System reading C/F _____		
Instrument reading C/F _____		
F. Thermocouple label:_____		
1. Location		
2. Wire Numbers and Destination		
3. Independent verification performed	Yes / No	
System reading C/F _____		
Instrument reading C/F _____		
G. Thermocouple label:_____		
1. Location		
2. Wire Numbers and Destination		
3. Independent verification performed	Yes / No	
System reading C/F _____		
Instrument reading C/F _____		
4. Switches		
A. System air proving / flow switch Setting: _____		
B. Combustion air proving / flow switch burner #1 – Setting: _____		
C. Combustion air proving / flow switch burner #2 – Setting: _____		
D. Combustion air proving / flow switch burner #3 – Setting: _____		
E. Combustion air proving / flow switch burner #4 – Setting: _____		
F. Combustion air proving / flow switch burner #5 – Setting: _____		
G. Excess negative pressure switch Setting: _____		

ITEM	CONDITION	COMMENTS
H. Low natural gas pressure switch		
Setting: _____		
I. High natural gas pressure switch		
Setting: _____		
J. Compressed air proving / flow switch		
Setting: _____		
K. Poppet valve positional proving / flow switches		
Setting: _____		
L. Other switch		
Setting: _____		
M. Other switch		
Setting: _____		
O. Pressure Transducers last calibration		
5. Actuators/Damper Controls		
A. System inlet actuator(s)		
1. Electric actuator		
2. Air actuated		
3. Hydraulic controlled		
Check operation, stroke, limit switches, spring return function (if applicable).		
4. Position sensors		
Limit switches		
Proximity switches		
B. Atmospheric bypass actuator(s)		
1. Electric actuator		
2. Air actuated		
3. Hydraulic controlled		
Check operation, stroke, limit switches, spring return function (if applicable).		
4. Position sensors		
Limit switches		
Proximity switches		
C. Fresh air /Dilution Air Inlet Actuator(s)		
1. Electric actuator		
2. Air actuated		
3. Hydraulic controlled		
Check operation, stroke, limit switches, spring return function (if applicable).		
4. Position sensors		
Limit switches		
Proximity switches		
D. Firing rate actuator(s)		
1. Electric actuator		
2. Air actuated		
3. Hydraulic controlled		
Check operation, stroke, limit switches, spring return function (if applicable).		
4. Position sensors		
Limit switches		
Proximity switches		
E. Hot gas by-pass actuator(if applicable)		
1. Electric actuator		

ITEM	CONDITION	COMMENTS
2. Air actuated		
3. Hydraulic controlled		
Check operation, stroke, limit switches, spring return function (if applicable).		
4. Position sensors		
Limit switches		
Proximity switches		
F. Actuator: (other)		
1. Electric actuator		
2. Air actuated		
3. Hydraulic controlled		
Check operation, stroke, limit switches, spring return function (if applicable).		
4. Position sensors		
Limit switches		
Proximity switches		
G. Actuator: (other)		
1. Electric actuator		
2. Air actuated		
3. Hydraulic controlled		
Check operation, stroke, limit switches, spring return function (if applicable).		
4. Position sensors		
Limit switches		
Proximity switches		
6. Variable Frequency Drive (VFD) #1		
A. Physical inspection – filters, fans, conduit, etc		
B. Performance test, record VFD output for several fan settings(i.e. 20%, 40%,60%, etc.)		
7. Variable Frequency Drive (VFD) #2		
A. Physical inspection – filters, fans, conduit, etc		
B. Performance test, record VFD output for several fan settings(i.e. 20%, 40%,60%, etc.)		
8. Motors		
Measure & record amp draws for all system motors. Compare readings to nameplate value		
9. Starters		
A. Overload Integrity – Ensure that overload setting matches max amp draw on motor nameplate.		
B. Chatter		
BURNER CONTROL		
10. Burner #1		
A. Temperature controller		
B. High limit controller		
C. Purge timer		
D. Flame signal (record typical signal range)		
E. Flame detector		
11. Burner #2		
A. Temperature controller		

ITEM	CONDITION	COMMENTS
B. High limit controller		
C. Purge timer		
D. Flame signal (record typical signal range)		
E. Flame detector		
12. Burner #3		
A. Temperature controller		
B. High limit controller		
C. Purge timer		
D. Flame signal (record typical signal range)		
E. Flame detector		
13. Burner #4		
A. Temperature controller		
B. High limit controller		
C. Purge Timer		
D. Flame signal (record typical signal range)		
E. Flame detector		
14. Burner #6		
A. Temperature controller		
B. High limit controller		
C. Purge Timer		
D. Flame signal (record typical signal range)		
E. Flame detector		
15. High Temperature Limit Controller(s)		
A. Accuracy		
B. Display		
C. Pushbuttons		
16. Chart Recorder		
A. Pens		
B. Accuracy		
C. Limits / alarms		
D. Legibility		
17. Lights (list those lights inspected)		
A. Physical inspection		
B. Performance		
18. Relays (list those relays inspected)		
A. Physical inspection		
B. Performance test		
19. Timers (list those relays inspected)		
A. Physical inspection		
B. Performance test		
20. Manual Switches (list those items inspected)		
A. Physical inspection		
B. Performance test		
21. Emergency Stops (list those stops inspected)		
A. Physical inspection		
B. Performance test		

ITEM	CONDITION	COMMENTS
22. Disconnects (list those items inspected)		
A. Physical inspection		
B. Performance test		
23. MMI		
A. Display		
B. Function		
C. Password protection		
1. In use? (if yes, record values)	Yes / No	
2. Adequate for this application.		
D. Limits / Allowable Ranges		
1. Check for consistency between PLC, MMI and all controllers.		
2. Fill out & attach the following:		
- RTO / RCO SETTINGS RECORD		
E. Latest program(s) downloaded		
1. PLC Program: _____		
Software ver.: _____		
Cable Used: _____		
2. MMI Program: _____		
Software ver.: _____		
Cable Used: _____		
24. Modem		
A. List phone number		
B. Is the line independent?	Yes / No	
C. Test access to PLC program		
D. Test access to alarm history		
DOCUMENTATION		
25. Power System		
A. Schematics		
B. Interconnection Diagrams		
C. Layout/Location Drawings		
D. Power Plan		
E. Drawing List		
F. User Manual		
G. Maintenance Manual		
H. Service Records		
26. Subsystems		
A. Schematics		
B. Interconnection Diagrams		
C. Drawing List		
D. User Manual		
E. Maintenance Manual		
F. Service Records		
27. Heat Recovery Systems		
A. Schematics		
B. Interconnection Diagrams		
C. Drawing List		
D. User Manual		
E. Maintenance Manual		
F. Service Records		

ITEM	CONDITION	COMMENTS
28. Subsystems		
Air Compressors:		
A. Schematics		
B. Interconnection Drawings		
C. Drawing List		
D. User Manual		
E. Maintenance Manual		
F. Service Records		
Air Dryer:		
A. Schematics		
B. Interconnection Drawings		
C. Drawing List		
D. User Manual		
E. Maintenance Manual		
F. Service Records		
Heat Recovery Systems:		
A. Schematics		
B. Interconnection Diagrams		
C. Drawing List		
D. User Manual		
E. Maintenance Manual		
F. Service Records		
Emissions Analysis Systems		
A. Schematics		
B. Drawing List		
C. User Manual		
D. Maintenance Manual		
E. Service Records		
29. Control System		
A. Schematics		
B. Interconnection Diagrams		
C. Sequence of Operation		
D. Program Ladder Diagram		
E. Manufacturer Cutsheets		
F. User Manual		

ITEM	CONDITION	COMMENTS
PROCESS CONTROL LOOPS		
30. System Startup Cycle		
A. Limit string verification		
B. Ramp / soak warm-up cycle		
1. Current setting: _____		
2. Average warm-up time: _____		
C. System ready / catalyst ready circuit		
1. Set point temperature: _____		
2. Delay: _____		
31. Bringing the Oxidizer Online:		
A. System Inlet/Atmospheric Bypass Circuit		
B. Interaction of System Ready Relay w/cust. Processes.		
32. Oxidizer Shutdown Cycle:		
A. Oxidizer Cool-down		
B. Oxidizer Downtime Settings – Ensure that there is a procedure in place for protecting components from stored heat upon shutdown. Ideally, compressed air should remain on.		
33. Oxidizer Bake-out Cycle:		
A. Function		
B. Settings		
C. Frequency of Use (comment at right)		
34. Alarms:		
A. Function – list alarms tested.		
B. Messages		
C. Alarm History – Check alarm history for repeat alarms and/or unexplainable alarms.		
35. Pressure Control System:		
A. Pressure Control System		
1. Setting		
2. Independent Manometer reading:		
B. VFD Tuning / Response – Record any changes on the RTO/RCO Settings Record Form.		
36. Poppet Valve Control:		
A. Function		
B. Cycle Time		
C. Retentive Timer for Start-up		
37. Temperature Control:		
Record any settings changes on the RTO/RCO Settings Record Form.		
A. Retention Chamber Control Loop		
B. Stack Temperature Control (short cycle)		
C. Hot Gas Bypass Temp control loop (if app.)		

ITEM	CONDITION	COMMENTS
BURNERS		
38. Burner Tuning – Burner #1		
A. Consistent Light off		
B. High Fire Differentials: 　1. Manufacturer's recommended values 　　Δp Gas = _____ 　　Δp Air = _____ 　2. Values measured with start-up airflow 　　Δp Gas = _____ 　　Δp Air = _____ 　3. Values measured with full process airflow 　　Δp Gas = _____ 　　Δp Air = _____ 　4. Values Adjusted		
C. Low Fire Differentials: 　1. Manufacturer's recommended values 　　Δp Gas = _____ 　　Δp Air = _____ 　2. Values measured with start-up airflow 　　Δp Gas = _____ 　　Δp Air = _____ 　3. Values measured with full process airflow 　　Δp Gas = _____ 　　Δp Air = _____ 　4. Values Adjusted		
D. Smooth Ramping Between Limits		
39. Burner Tuning – Burner #2		
A. Consistent Light off		
B. High Fire Differentials: 　1. Manufacturer's recommended values 　　Δp Gas = _____ 　　Δp Air = _____ 　2. Values measured with start-up airflow 　　Δp Gas = _____ 　　Δp Air = _____ 　3. Values measured with full process airflow 　　Δp Gas = _____ 　　Δp Air = _____ 　4. Values Adjusted		
C. Low Fire Differentials: 　1. Manufacturer's recommended values 　　Δp Gas = _____ 　　Δp Air = _____ 　2. Values measured with start-up airflow 　　Δp Gas = _____ 　　Δp Air = _____ 　3. Values measured with full process airflow 　　Δp Gas = _____ 　　Δp Air = _____ 　4. Values Adjusted		
D. Smooth Ramping Between Limits		

ITEM	CONDITION	COMMENTS
40. Burner Tuning – Burner #3		
A. Consistent Light off		

B. High Fire Differentials:
    1. Manufacturer's recommended values
       Δp Gas = _____
       Δp Air =   _____
    2. Values measured with start-up airflow
       Δp Gas = _____
       Δp Air =   _____
    3. Values measured with full process airflow
       Δp Gas = _____
       Δp Air =   _____
    4. Values Adjusted		

C. Low Fire Differentials:
    1. Manufacturer's recommended values
       Δp Gas = _____
       Δp Air =   _____
    2. Values measured with start-up airflow
       Δp Gas = _____
       Δp Air =   _____
    3. Values measured with full process airflow
       Δp Gas = _____
       Δp Air =   _____
    4. Values Adjusted		

D. Smooth Ramping Between Limits		
41. Total System Airflow Verification:		
Total System Airflow _____ SCFM		
42. System Pressure-Temperature Profile:		

COMMENTS: